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ABSTRACT

The trends from 1970-75 in course-by-course grading at a large public urban university are described. A total of 144 undergraduate courses were analyzed to determine if systematic grade inflation was occurring. Multiple linear regressions were fitted to more than 125,000 final course grades by courses. Most course grading patterns showed little evidence of systematic and homogeneous change over time. The increasing cumulative grade point average for undergraduates at the institution was not caused by a general relaxing of grading students. The supposition is that more students are moving away from traditional curricula into courses and degree programs that they find have grading standards reflecting their abilities and/or interests. Regression data for five courses, a chart on the net changes in average grades for 122 courses, and a conceptual schema for grade results are appended. (Author/SW)

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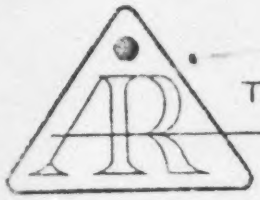

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A LONGITUDINAL STUDY OF GRADES IN 144 UNDERGRADUATE COURSES

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Abstract

This paper describes the trends in course-by-course grading at a large public urban university over a recent six-year period. To determine if systematic grade inflation was occurring the study analyzed 144 individual undergraduate courses. Multiple linear regressions were fitted to more than 125,000 final course grades by courses. Most course grading patterns showed little evidence of systematic and homogeneous change over time. Hence, the increasing cumulative GPA for undergraduates at the institution studied was not caused by a general relaxing of grading standards. Rather, the supposition is that more students are moving away from traditional curricula into courses and degree programs which they find have grading standards reflecting their abilities and/or interests.

A Longitudinal Study of Grades in 144 Undergraduate Courses

Grade inflation is a popular label to identify the conspicuous change in grading patterns in higher education (Davidson, 1975; Etzioni, 1975; Suslow, 1977). It is important to note that the assertions concerning grade inflation are most often based upon a change in cumulative grade point average, heedless of the fact that this measure represents the standards of a diverse collection of courses. Little evidence is available to determine whether grading standards have changed in individual courses.

Using controls for student ability, program of study, and longitudinal trend, institutional researchers at a large public urban university analyzed how grades are changing.[1] This paper presents the findings from a longitudinal study of undergraduate grades on a course-by-course basis. Specifically, the research addressed these questions:

1. Do different undergraduate courses exhibit measurably different grading patterns?
2. What is the longitudinal trend in grades within undergraduate courses, and does major field of study affect grades within courses?

The premise is that different courses have different grading patterns. Further, if grades in these individual courses have not trended upward in five years, the rising grade point average (GPA) may be attributed to a change in the course mix. Suddarth (1975) studied the impact of core curricular requirements on students at her institution and noted that the experimental group permitted to waive these requirements did achieve a higher grade index.

Review of the Literature

Despite many expressions of concern by faculty about the apparent decline in academic standards (Ladd & Lipset, 1977), empirical studies are conducted infrequently to measure the actual extent of changes in grading. Because of

inadequate computerized data bases, the problems of missing demographic student data, and the difficulty of analyzing large data sets at many institutions, grade studies have focused on the impact of a few individual factors rather than undertake the course-by-course analysis which is needed. An extensive review of the literature revealed no research comparable to the total-institution scope of the present study.

Adaptation-level theory presented by Helson (1947) notes the influence of background stimuli on judgments. The theory is applied in several grade studies (Aiken, 1963; Hills, 1964; Hills & Gladney, 1968) to the issue of grading the individual students' performance against the background of the student body's performance level, i.e., overtly or covertly grading on the "curve." In these studies, grading standards are regarded as being determined in part by the ability level of the total student population.

In a study of the pattern of grades achieved across twelve curricular areas and their relationship to aptitude as measured by high school GPA and SAT scores, Schoenfeldt and Bush (1975) applied the adaptation-level theory. They found that independent of aptitude the highest average grades are in the course grouping of education and the lowest in the physical and biological sciences. Goldman, Schmidt, Hewitt & Fisher (1974) investigated grading practices in different major fields. "The results indicated that . . . those fields with lowest ability students adopt the lowest grading standards. Similarly, high grading standards are adopted by fields with high ability students" (p. 343). They surmised that because of the stringent grading standards of the natural and physical sciences, low ability students are effectively precluded from these fields and are absorbed by the social sciences and humanities.

Goldman and Hewitt (1975) addressed the impact of differential grading standards on enrollment and ultimately on the composition of a university. They rationalized that since courses with lenient grading standards tend to

attract the low and middle ability students, these courses enjoy greater growth and that faculty hiring by field is based largely upon course enrollments.

Goldman and Slaughter (1976) analyzed grades for five classes and 254 students by correlating the grades with the aptitude measures of high school GPA's and SAT's. The R^2's (multiple correlations squared) between individual courses and aptitude were found to be higher when compared with the R^2's between cumulative GPA and aptitude. On the basis of the differences between the R^2's, they concluded that grades across courses are heterogeneous items which introduce a large element of unreliability into predicting cumulative GPA on the basis of ability. Goldman and Widawski (1976), basing their analysis on students who have taken the same pair of courses, measured the differences between pairs of course grades. They concluded that different grading standards exist for different departments within the same university and that some of these differences are quite substantial.

Method

The study sample contained records for 9,338 current undergraduate students who had attempted 40 or more hours as of fall quarter, 1975. More than 125,000 grades were recorded for these students in 144 individual courses covering the period from fall, 1970 through fall, 1975. An undergraduate course was included if a total of at least 500 students was enrolled during the study period.

As operationally defined for this study, "grade inflation" is a consistent, systematic increase in average grades received by students in a particular course, after taking into account the students' major fields and background. The term systematic increase in grades is emphasized because rising average grades may reflect increased learning. If grades increase systematically for five years, there is stronger evidence of inflation in grading practices, as compared to annual fluctuations. The general linear model of stepwise multiple regression was used to study change in grades through time. This flexible and powerful

technique permits comparable analyses for different courses. Since grade analysis is still in the formative stage, the approach in this study is exploratory and focuses on empirical findings.

The level of measurement was the student's final course grade for each course analyzed. The dependent (response) variable was the final course letter grade using the 4.0 scale where A = 4, B = 3, C = 2, D = 1, and F and WF = 0. Incompletes, audits, and withdrawal grades were excluded. Independent (carrier) variables included the year and quarter a course was taken, major fields of study, demographic characteristics (age, sex, minority status, class, veteran status, credit hours attempted, credit hours transferred, and number of years since high school graduation), and academic characteristics (cumulative GPA, major field of study, high school GPA, transfer GPA, and scores on the verbal and quantitative sections of the SAT).[2] Test scores and age were not available for each individual student. When a variable had a missing value, the mean value for the appropriate variable was substituted. To determine the impact of this method of handling missing data, dummy variables were constructed which indicated where the missing values were inserted (Cohen & Cohen, 1975). This technique allowed an objective measure of the impact of missing data on the dependent variable.

Limitations

It is not possible to account for all factors that may influence grades. Such student characteristic variables as personality, artistic ability, and the like are not controlled for. Only those variables available in the computerized student data base were included in the study. Ability levels of students were systematically controlled for on a course-by-course basis; however, the data base sample did not permit comparisons of student abilities in one course with student ability levels in another course.

Another limitation is that no criteria external of grades themselves, such as standardized achievement tests, were available to account for learning--i.e., maturation effects--by students. Thus, the proposed test of grade inflation is most liberal and the estimates of grade inflation contain a maturation component. That is, the bias is toward finding grade inflation, and the actual amount of grade inflation itself is certainly lower than these estimates. The degree to which grade inflation was present in variables such as high school GPA's and transfer GPA's is not known and its effects were assumed to be random and independent.

Results

Individual Courses

Table 1 presents the regression analyses for a cross-section of the 144 individual courses.[3] High, medium, and low grading courses (as determined by the mean sample grade) are included as well as a variety of disciplines. The following summaries of five courses are meant to be a guide to the interpretation of the table. The complex and dynamic relationships cannot be summarized in a few short statements. A conservative interpretation of the findings focuses primarily on those unstandardized regression estimators which are more than twice their standard error. The unstandardized regression coefficients may be interpreted in units of a letter grade on the 4.0 scale. The demographic and test score variables are in their original metric form and would be multiplied by their regression coefficient to produce the estimated proportion of a letter grade accounted for by that variable. The year, quarter, major, and missing data variables are in the "dummy" variable format and the unstandardized regression coefficient for these dummy variables may be directly interpreted as a proportion of a letter grade when the characteristic is found to be present in a case.

Education. This is a junior-level course in educational psychology. With a mean sample grade of 3.37 and a regression constant estimator of 1.13, it is an example of a high-grading course. The grading trend during the study period has been downward. This can be illustrated by noting how the estimators for the course drop systematically from .43 in 1971 to -.15 in 1975 which is indicative of .58 decrease in a letter grade controlling for all other factors. The course illustrates grade deflation. Psychology majors receive on the average .31 of a letter grade higher in this course than in their other courses. Other major field estimators which are positive include: political science (.60), biology (.52), and secondary education (.21). The estimator for summer quarter is -.11 and for spring, .14. This indicates that students of similar academic ability levels would be predicted to receive one-fourth of a letter grade higher spring quarter than those who take the course summer quarter.

Insert Table 1 about here

Biology. This freshman course in human anatomy is one option which may be used to fulfill a laboratory science requirement. The sample mean grade for students taking this course is 2.26 with a regression constant estimator of .22, indicators that the course is associated with lower grading. While grades increased during the study period (estimators increased from -.86 in 1971 to -.17 in 1975), the course remains low-grading. Average grades increased systematically by .69 of a letter which is evidence of grade inflation. Biology majors (.86) and nursing majors (.23) record high average grades in the course while secondary education majors (-.67) receive grades which are low compared to their other courses.

In addition to the previous examples of course inflation and deflation, the courses described below show little systematic grade change through time.

English. This basic freshman writing composition course is in the middle range of grading with a mean sample grade of 2.51 and a regression constant

estimator of .11. Between 1971 (.37) and 1975 (.47), average grades changed by only .10 of a letter. Undergraduate majors in English (.42), journalism (.21), and special education (.31) average systematically higher grades in this English course. General studies (-.18), elementary education (-.25), and early childhood education (-.38) majors, on the other hand, record lower average grades. Female students average .11 of a letter grade higher than males, but minorities show no systematic difference in average grades from non-minority students. SAT-Verbal scores have a slight, but definite, positive impact on grades received in this English course.

Business. This junior-level business law course is an introductory survey in law and the judicial system. Average grades changed by only one-third of a letter grade during the study period and the course remains in the middle range of grading. The mean sample grade is 2.76 and the regression constant estimator is -.50. Social welfare majors (1.56) receive high average grades as do accounting (.20), management (.13), and undeclared majors (.18). Secondary education majors (-.76) average lower grades in this business course than in their other courses. Age (.02) has a slight positive impact on grades received. Also, the more credit hours attempted to date, the higher the final course grade, on average. One finding which cannot be easily explained is that those students who were missing data on the number of years since high school graduation from their student records tend to receive higher average grades in this course. Students taking the course in the winter quarter (-.09) average slightly lower grades.

Sociology. With a mean sample grade of 2.60 and a regression constant estimator of .99, this senior-level course in urban sociology is a final example of a middle grading course. Note the annual fluctuation in grades during the study period. Political science majors (.67) record high average grades while

law enforcement (-.17) and elementary education (-1.39) majors receive grades lower than average for their course work. When all other variables are held constant, students taking this course in the fall record higher grades on the average. While the number-of-hours-transferred variable evidences a positive impact on course grades, Transfer-GPA shows a negative impact.

Course Summary. The overall findings from the 144 courses analyzed follow. Different courses do indeed have different final grade indicators. There is sufficient empirical evidence to conclude that different courses exhibit measurably different grading patterns. The sample mean grades for the courses ranged from 2.01 to 3.76. The individuality of course grades was highlighted in the five separate course summaries. Many of the 144 courses have highly predictable grades using this set of predictor variables. The academic field of the course is strongly related to the pattern of grades recorded. Courses emphasizing quantitative and factual learning generally have low grades and low regression constants. The high grades are found in career-oriented courses, such as teacher training. Thus, grades are influenced to no small degree by the associated discipline and the different grading standards of these diversified disciplines (Oh, 1976; Prather & Smith, 1976; Goldman & Widawski, 1976). The course-by-course analyses show an interesting interaction of predictor variables with course grades. Grades seem to result from a complex interaction of faculty, students, and curricula. Figure 1 is a simplified schema of how the authors envision this dynamic interaction.

Insert Figure 1 about here

Longitudinal Trends and Influence of Major Field Within Course Grades

There is not a general, systematic increase in average grades throughout the 144 courses when controlling for student ability levels and program of study. The relatively few courses (23 of 144 or 16 percent) that show a

systematic increase over the five-year period often remain the low-graded ones in the curricula even after taking the increase into account. A few courses (6 of 144, or 4 percent) decreased systematically, but these are almost all high-graded courses. Both the extremely high and extremely low-graded courses show a trend of regressing toward the mean. The majority of the courses, or those in the middle grading range, do not increase systematically from year to year for the five-year period. Figure 2 illustrates the net change in average letter grades for individual courses, irrespective of annual fluctuations which are not indicative of a trend. Note that even with this liberal criterion, the majority of the courses do not increase or decrease by as much as one-half letter grade over the five-year period. The histogram shows a normal distribution in net change skewed slightly to the right.

Insert Figure 2 about here

This finding on the longitudinal pattern of course-by-course grading is contrary to the dramatic increasing of GPA's at the university studied over this same period, indicating that the GPA is a low reliable measure to use in determining how grades are changing. The course-by-course trend is also incongruent with a major-by-major trend of undergraduate grades for the same study population.[4] This incongruity implies that the faculty in general have not altered their grading patterns in individual courses, but that students have altered their course enrollment patterns over time. It is also indicative of curricular changes over the period and that the course mix changed throughout most programs of study at this institution.

A perusal of this university's catalogs substantiates these curricular changes. Newer course offerings by the catalog comparisons are found to be associated with higher grading patterns in the course-by-course analysis. The course listings show that many new specialized courses have been added and that these courses reflect a less structured curriculum generally.

Major field of study is strongly associated with the grades students receive in courses throughout the curriculum. Majors tend to receive better grades in some disciplines while doing poorer in others. For example, English majors tend to receive relatively higher grades in education courses than in their other courses, while the grades they receive for physical science and foreign language courses are, on the average, lower. Physical science courses generally record lower grades for all majors, while teacher education courses comparatively record higher grades for all majors. These findings also support the proposition that the various parts of the curriculum have different grading standards because there is a distinctive pattern of grading by disciplines.

Discussion

Undergraduate degree programs at postsecondary institutions have grown substantially in recent years, but the growth rate by academic specialty has not been uniform. Enrollments in the traditional fields are stabilizing or declining while enrollments in the recently popular professional fields are increasing. The curriculum in higher education is viewed as a dynamic and interacting system, responding to a complex set of diverse demands from society in general and from within the higher education community specifically. Grades are a function of faculty standards, student aptitudes and characteristics, and programs of study. It is the programs of study that policy making in higher education can most readily influence.

A national study of undergraduate college curricula over the last decade documented a radical change from traditional core, general programs of study to specialized, narrow fields of concentration (Blackburn, Armstrong, Conrad, Didham and McKune, 1976). Moreover, the move has been away from specific course requirements to distribution requirements. Contemporary college students select from a less specified set of course offerings and now have many alternatives to high risk courses.

The grade point average at this university has followed the national trend in higher education and has been increasing for a number of years, while aptitude scores of the student population have been decreasing. During this same period it has also evidenced substantial changes in program enrollments and curricula. Grades in 144 individual courses presented in this paper exhibited small evidence of systematic inflation, indicating that it is the course mix that has changed and not generally the standard of grading within individual courses over time. The course grades varied widely by discipline. Based upon this and previous research on final-letter-grade patterns, a supposition is offered:

> College faculty as a group are not assigning higher grades gratuitously on an individual course basis over time. Rather, among the student population, there has been a shift in course enrollments and majors away from traditional curricula to newer curricula. It is suggested that many of the students involved in this shift have been exercising their prerogatives of choice in order to avoid courses with traditionally low grading practices, resulting in course proliferation and increasing GPA's. That is, more students are moving into degree programs which they find have grading standards reflecting their abilities and/or interests.

Footnotes

[1]Upon request, the authors will provide a list of the grade studies conducted at the university and the ERIC document numbers. These studies were conducted at the request of several university-wide faculty committees for the purposes of the institutional self-study program for accreditation.

[2]The demographic variables were coded: Class Standing: Freshman = 1, Sophomore = 2, Junior = 3, Senior = 4; Sex: Female = 1, Male = 0; Minority Status: Minority = 1, Non-Minority = 0; Veteran Status: Veteran = 1, Non-Veteran = 0.

[3]The analysis of each of the 144 courses is contained in a separate report (see footnote (1) above). This report also contains the regression equations and a more detailed description of the general linear model and statistical procedures.

[4]The grade analyses of 63 majors showed an upward trend for 45 (71%), while systematic grade inflation could be seen in 14 (22%) of the majors.

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TABLE 1

EFFECT OF STUDENT CHARACTERISTICS AND TREND VARIABLES ON GRADES RECEIVED IN FIVE INDIVIDUAL UNDERGRADUATE COURSES, 1970-1975

		EDUCATION	BIOLOGY	ENGLISH	BUSINESS	SOCIOLOGY
REGRESSION DATA	CONSTANT TERM	1.13	.22	.11	- .50	.99
	NUMBER OF GRADES	1053	541	3916	2414	678
	R^2	.24	.65	.30	.35	.44
	STANDARD ERROR	.73	.64	.75	.75	.63
	MEAN SAMPLE GRADE	3.37	2.26	2.51	2.76	2.60
	STANDARD DEVIATION	.82	1.03	.89	.92	.81
		UNSTANDARDIZED REGRESSION ESTIMATORS				
VARIABLES* YEAR	1971	.43	- .86	.37	.13	- .09
	1972	.01	- .20	.34	.13	
	1973	.13	- .21	.17	.22	- .02
	1974		- .18	.31	.50	- .30
	1975	- .15	- .17	.47	.46	- .17
QUARTER	FALL	.03	- .07			.20
	WINTER		- .06	- .02	- .09	- .05
	SPRING	.14	.05	.04	- .02	.01
	SUMMER	- .11		.10	.04	
TEST SCORES	CUMULATIVE GPA	.60	1.20	.72	.84	.88
	HIGH SCHOOL GPA	.03	- .08	.03	.004	.03
	TRANSFER GPA	- .02	- .06	- .01	- .006	- .08
	SAT - MATH	.0004	.0002	- .0002	- .00009	- .0005
	SAT - VERBAL	- .0006		.0008	.0005	.0005
DEMOGRAPHIC	AGE (YEARS)	.02	- .01	- .008	.02	- .008
	CLASS STANDING	.02	- .15	.04	- .04	- .11
	HOURS ATTEMPTED	.0004	.0004	- .002	.002	.001
	HOURS TRANSFERRED	- .001	.003	- .0003	.0007	.002
	MINORITY	- .03		- .01	- .09	.08
	FEMALE	.10	- .10	.11	.008	.04
	VETERAN	- .04	-1.09	- .007		- .02
	YRS. SINCE H.S. GRAD.	- .01	.006	.002	- .005	.004
MAJOR	ACCOUNTING			- .05	.20	.05
	ANTHROPOLOGY	.37	.32	- .15	.10	
	BIOLOGY	.52	.86	.01	.48	
	BUSINESS EDUCATION	.10	.46	- .04	- .08	
	EARLY CHILDHD. EDUC.	.05	- .41	- .38		- .11
	ECONOMICS	- .32	.38	.07	.09	- .11
	ELEMENTARY EDUCATION	.009	- .31	- .25	- .04	-1.39
	ENGLISH	.17	.74	.42		.32
	FINANCE			- .15	.16	
	GENERAL STUDIES	.08		- .18	- .23	
	HISTORY	.09	-1.07	.04	.12	- .17
	JOURNALISM	- .15	- .39	.21	- .13	.25
	LAW ENFORCEMENT	.16	.33	- .06	.11	- .17
	MANAGEMENT	- .28	- .24	- .07	.13	- .45
	MARKETING	.30	.47	- .13	.12	- .30
	MATH	.04	- .42	.05		.22
	MEDICINE, GENERAL		.62	.10	.81	
	MUSIC	- .09	- .12	- .10	.38	1.08
	NURSING	.06	.23	- .08	.33	.05
	POLITICAL SCIENCE	.60	- .19	.05	.19	.67
	PSYCHOLOGY	.31	.29	- .09	- .04	.05
	REAL ESTATE		.64	- .12	.16	- .94
	SECONDARY EDUCATION	.21	- .67	- .06	- .76	
	SOCIOLOGY	- .12	.21	- .13	.26	- .09
	SOCIAL WORK	.37	.44	- .20	1.56	- .10
	SPECIAL EDUCATION	.07	.80	.31	.15	
	STUDIO	- .09	.29	.06	.20	
	UNDECLARED	- .04	.05	- .09	.18	- .16
MISSING DATA	MISSING:					
	AGE (YEARS)	.27	- .28	.06	- .12	.03
	SAT - MATH		.15			.96
	SAT - VERBAL	- .02				- .92
	H. SCHOOL GPA	- .05	- .07	.02	- .05	- .08
	YRS. SINCE H.S. GRAD.	- .11	.02	.008	.18	.10

*Metric demographic and test score variables are in their original form. The year, quarter, major, and missing data variables are measured as "1" if characteristic is present in a case, "0" otherwise.

FIGURE 1

A CONCEPTUAL SCHEMA FOR GRADE RESULTS

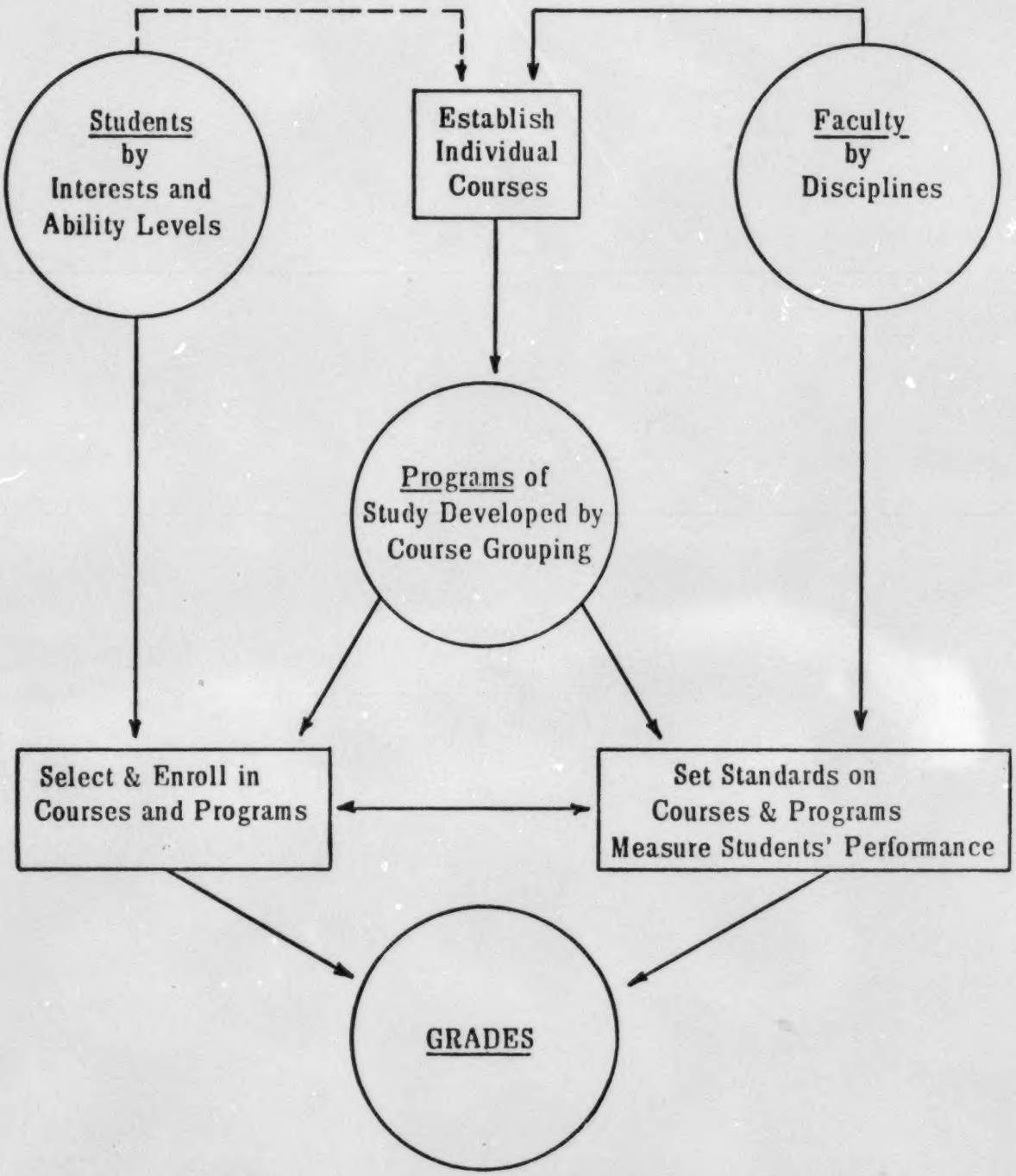
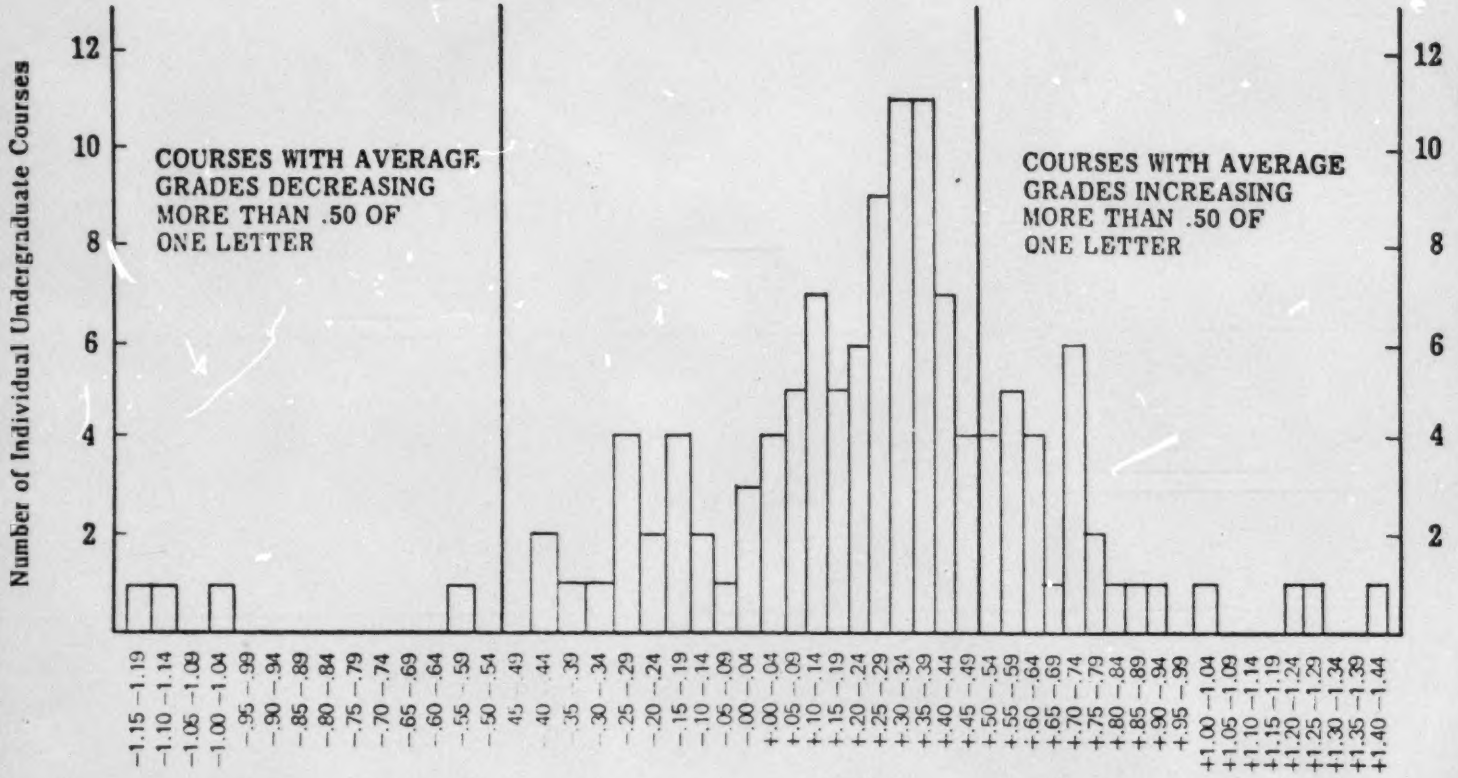

Students by Interests and Ability Levels
Establish Individual Courses
Faculty by Disciplines
Programs of Study Developed by Course Grouping
Select & Enroll in Courses and Programs
Set Standards on Courses & Programs Measure Students' Performance
GRADES

Figure 3

NET CHANGE IN AVERAGE GRADES FOR 122 UNDERGRADUATE COURSES *
1971 – 1975

(FREQUENCY INTERVALS = 5/100th OF ONE LETTER)



NET CHANGE OVER 5 YEAR PERIOD

* 22 courses were removed from consideration because less than four years of data were available.